Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

ET-49 May 1935

SOIL SIFTERS FOR SUBTERRANEAN INSECTS

By R. E. Campbell and M. W. Stone, Division of Truck Crop and Garden Insects, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture

During the progress of wireworm investigations in the Pacific Coast States, it has been necessary to sift large quantities of soil from fields and from experimental plots in order to ascertain and record the wireworm populations contained therein. The soil-sifting is performed primarily to obtain information regarding the degree of effectiveness of various soil treatments or soil manipulations, such as flooding, desiccation, fumigation, and crop rotation, upon wireworm control. This method is also used in studies pertaining to the movement of wireworms in the soil and to obtain stocks of the insects to be used for experimental purposes.

In the early stages of the investigational work it became apparent that mechanical equipment must be devised which would increase the speed and efficiency of the soil-sifting process and decrease the manual labor and cost involved. Beginning with a crude hand-operated sifter, progressive mechanical improvements have been made with the result that two very satisfactory soil-sifting units have been developed. One of these units is hand-operated and the other unit is a mobile, motor-driven apparatus.1/

Hand-operated Soil Sifter

The hand-operated soil sifter is illustrated in figures 1 and 3. The framework of the sifter standard is collapsible, so that it can be taken apart and transported in a small space. The upper and lower pieces are surfaced timbers 2 by 3 inches in dimension. Each upper piece has a 5/8-inch by 5/8-inch rabbet on the inner side, thus forming a track for the wheels. The upper and lower pieces have uprights mortised and glued into them, as shown in figure 3. Four 3/8-inch steel rods, threaded at each end, connect the two sides of the standard. With lock nuts on the inside and wing nuts on the outside, the apparatus may be put together quickly and firmly, and as quickly dismantled.

Roller-skate wheels are attached to 1/4-inch steel axles, which are firmly bolted to the bottom of the sifter. The axles should be about 10 inches from each end to facilitate dumping. The screen frame may be enlarged slightly, but 18 by 30 inches proved quite satisfactory. Screen of any desired mesh may be used in the frame of the sifter.

1/ The development of the motor-driven apparatus described in this circular was aided by published descriptions and direct observation of similar equipment used for the same purpose in wireworm investigations by Messrs. M. C. Lane and F. H. Shirck, and their associates, at the field laboratories of the Bureau of Entomology and Plant Quarantine located at Walla Walla, Wash., and at Parma, Idaho.

Motor-driven Soil Sifter

The motor-driven sifter is illustrated in figures 2, 4, and 5. This sifter is constructed on a light-weight pneumatic-tired automobile trailer, and derives its power from a small gasoline engine. With this arrangement the sifter is easily transportable, the manual labor involved in sifting operations is greatly reduced, and the process of examining soil samples for wireworms is accelerated.

The side pieces used in constructing the lower frame of the sifter consist of two timbers, each of which is 3 by 4 inches in dimension and 6 feet in length. The cross pieces of the frame are 2 by 3 inches in dimension. The motor platform, located on the left side of the sifter, is nailed to the extensions of two of the cross pieces, reinforced by an additional and shorter cross piece underneath the motor. The framework is bolted to the axle and radius rods of the automobile trailer.

A three-fourths horsepower gasoline engine, bolted to the motor platform, is used as a source of power. The engine weighs approximately 67 pounds, is of one-cylinder construction, air-cooled, and has a kick starter. Its maximum speed is 1,800 r.p.m.

The main feature of this soil sifter is the shaker arms, or flexible torques, such as are used on clover hullers or threshing separators. They are made of straight-grained hardwood, preferably second-growth hickory or maple, 21 inches long, $1\frac{1}{2}$ inches square, and tapered to 5/8 inch as shown in figure 4. The lower ends are bolted firmly to the lower framework. They stand erect, and the upper framework rocks back and forth on them. In the upper end of each shaker arm is a slightly enlarged $\frac{1}{2}$-inch hole. Near each end and close to the lower edge of the sides of the upper framework are $\frac{1}{2}$-inch bolts which fit into the upper holes in the shaker arms.

The screen frame is 41 by 24 inches in dimension, and slides tightly into a slot in the upper framework. It is held in place by a removable pin, so that it can be drawn out for dumping. This removable feature also permits the use of screens of different mesh, as may be required. The upper framework is made of hardwood $1\frac{1}{4}$ by $3\frac{1}{2}$ inches. It is 42 inches long by $26\frac{1}{2}$ inches wide. The corners are strengthened with pieces of angle iron. The connecting arm is 16 inches long and has a bushing at each end. One bushing fits over the crank pin and the other is attached to the upper framework of the shaker by means of a wrist pin and two pieces of angle iron.

The crank disk is 3 inches from the center of the shaft to its outer edge and has a slot so constructed that by fastening the crank pin of the connecting arm close to the center, or toward the outside, the length of the stroke can be varied from $1\frac{1}{2}$ to 5 inches. With a $1\frac{1}{2}$-inch driver pulley on the gasoline motor and a 12-inch pulley on the shaft, a speed of approximately 200 strokes per minute is attained.

This soil sifter can be constructed at a cost of approximately $25, to which must be added the price of the automobile trailer and the gasoline engine.

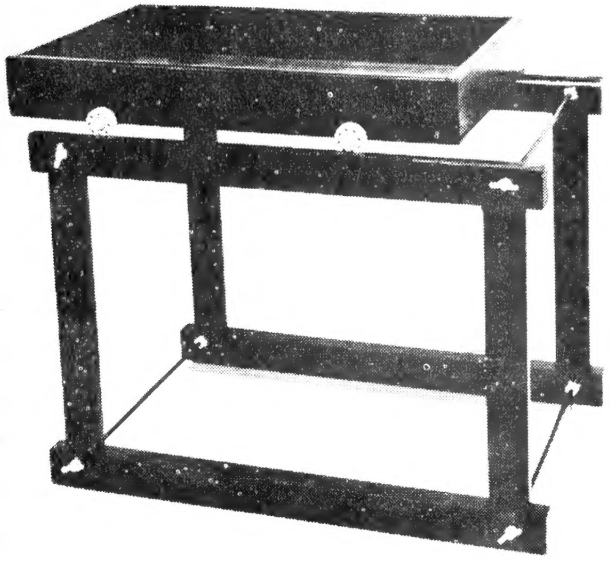


Figure 1. - Hand-operated soil sifter.

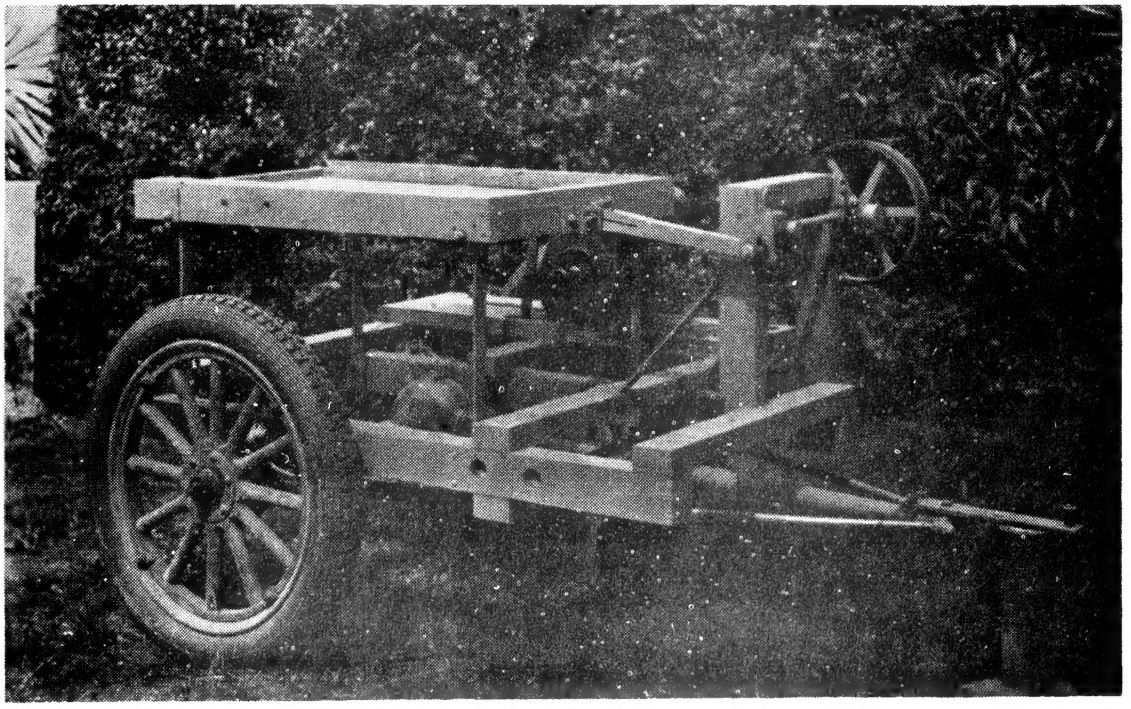


Figure 2. - Motor-driven soil sifter.

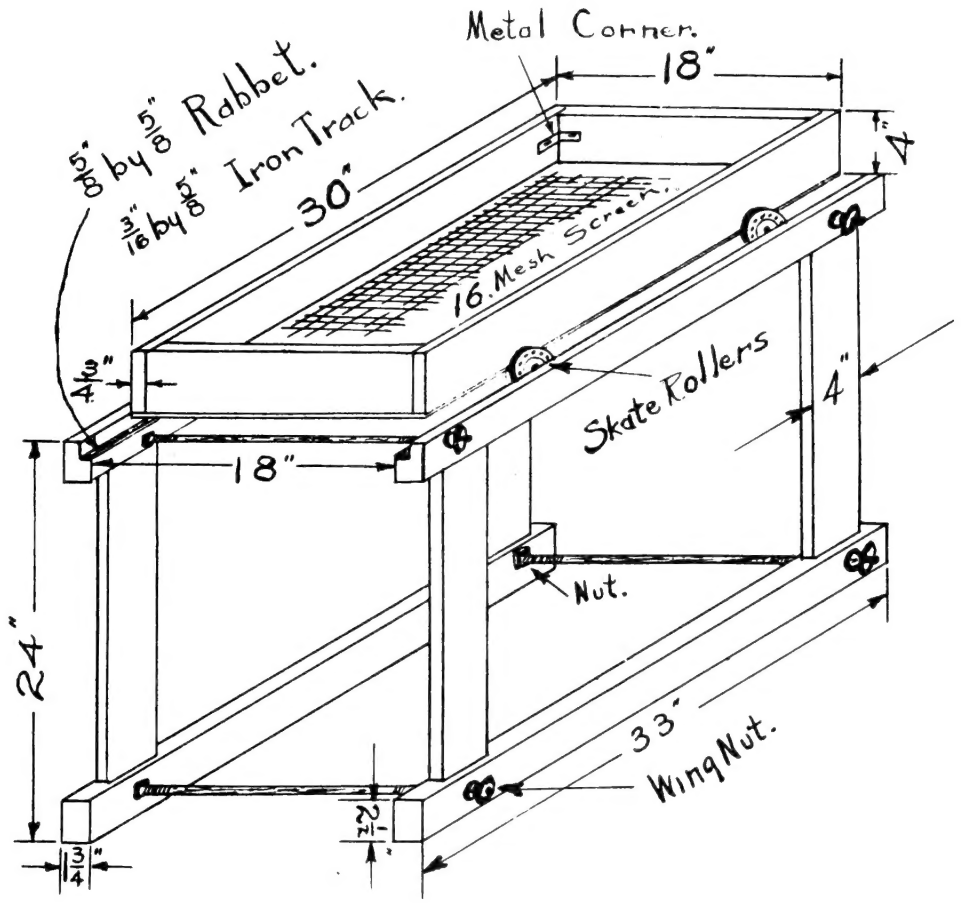
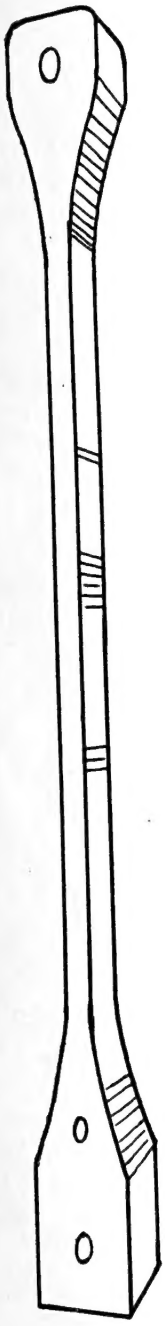
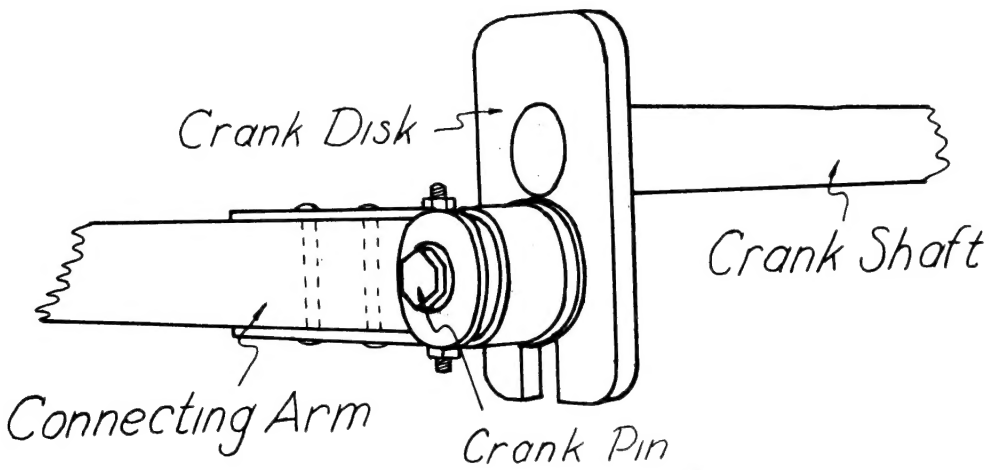


Figure 3. - Construction details of hand-operated soil sifter



FLEXIBLE TORQUE

Fig. 4



CRANK DISK ASSEMBLY

Fig. 5